LAND OFF
SYWELL ROAD
MEARS ASHBY
NORTHAMPTONSHIRE

GEOPHYSICAL SURVEY

Work undertaken for
Lark Energy Ltd

Report produced by
S J Malone PhD MIfA

January 2014

National Grid Reference: SP 838 687
OASIS Reference No.: archaeol1-168569

APS Report No: 02/14

ARCHAEOLOGICAL
PROJECT
SERVICES

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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken in connection with proposed development on land north of Sywell Road, Mears Ashby, Northamptonshire. The survey area totalled c. 24ha.

The survey revealed a number of linear and curvilinear features of potential archaeological origin, for the most part in the southwestern area of the field. However, overall responses are very weak with little magnetic contrast, so that natural variation may be responsible for some of the less coherent and more intermittent response.

Former areas of medieval ridge and furrow cultivation produce a clear response in the north and west, but otherwise the most obvious anomalies can be matched to the locations of field boundaries and ponds shown on earlier mapping but since removed.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as *'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (IFA 2008).

2.2 Background

Archaeological Project Services was commissioned by Lark Energy Ltd to undertake detailed magnetometer survey totalling some 24ha on land north of Sywell Road, Mears Ashby, Northamptonshire in connection with proposed development of the area. The survey was carried out between the 11th December 2013 and 10th January 2014.

2.3 Topography and Geology

Sywell and Mears Ashby are located 5.4km southwest of Wellingborough and 11km northeast of Northampton, in the administrative district of Wellingborough, Northamptonshire (Fig. 1).

The proposed development site is located 2km north of the centre of Mears Ashby and 2km northwest of Sywell, to the north of Sywell Road, at National Grid Reference SP 8377 6868 (Fig. 2)

The survey area lies at a height of c. 120m OD on land that slopes broadly down to the south, with a slight slope down to the west, towards a minor watercourse along the parish boundary with Sywell.

Local soils are of the Hanslope Association, typically calcareous pelosols, with pelo-stagnogley soils of the Ragdale Association in the northern part of the site (Hodge *et al*. 1984, 209; 293). These soils are developed on a drift geology of glacial till which in turn seals a solid geology of Jurassic limestones of the Upper Estuarine Series (GSGB 1974).

3. GEOPHYSICAL SURVEY

3.1 Methods

Location and layout of the survey areas is shown in Figure 2. The field was under low cereal/grass crop and in good condition for survey.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2011) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington

Instruments Ltd. This records subtle changes in the magnetic field resulting from differing features in the soil. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

Magnetometers measure changes in the Earth's magnetic field. With two sensors configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

The mapping of anomalies in a systematic manner allows interpretation of the type of material present beneath the surface. Strong magnetic anomalies are generated by buried iron-based objects or by kilns or hearths, usually resulting in a bipolar (positive/negative) response. More subtle positive anomalies representing pits and ditches can be seen where these contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). A negative anomaly may result from upcast bank material. Wall foundations can also show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique.

It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features.

Sampling interval and data capture
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

Processing and presentation of results
Processing is performed using specialist ArcheoSurveyor software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves flattening the background levels with respect to adjacent traverses and adjacent grids (Destripe or zero mean traverse). Despiking is also performed to reduce the effect of the anomalies resulting from small iron objects often found on agricultural land. Further processing can then be carried out which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following are the processing techniques carried out on the processed gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)
Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -3 to 3nT.

3.2 Results

The presentation of the data for the site involves a print-out of the raw or minimally processed data as greyscale and trace plots (Figs 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, 18, 19; clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Figs 5, 8, 11, 14, 17, 20, 21). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 22) and are described below.

Linear positive anomalies
A small number of positive linear and curvilinear anomalies of potential archaeological origin are highlighted in the southwest corner of the field at **A**. Responses are weak with little magnetic contrast overall and these intermittent linear and curvilinear responses remain difficult to interpret. However, their alignment differs from that of the extant and known removed boundaries, so they may represent something of greater antiquity. A possible small enclosure can be seen at **B**. The response is weak and somewhat diffuse and sits quite symmetrically astride enclosure period field boundary **C**, to which it perhaps relates. However, there is a weaker, less rigidly straight, linear response **D**, just to the north, perhaps suggesting some different, perhaps earlier, arrangement here. Further linear responses at **E** and **F** also correspond to the locations of field boundaries shown on earlier maps. A number of other weak and very straight responses **G**, **H**, **I** in the north and east of the field, probably relate to drainage or further subdivision of the field.

Agricultural response
Three areas of parallel gently curving linear response, indicative of former medieval ridge and furrow cultivation, can be seen on the northern and western side of the survey area. The northernmost block is the most coherent, the southernmost only a fragmentary remnant. None were evident at the ground surface during survey.

Magnetic disturbance
Strong area bipolar response generally results from larger metal items (either buried or at the surface) but may also be caused by concentrations of debris at field margins or by metal elements in fencing of boundaries. They are most notable here along the lines of former field boundaries (e.g. the continuation of **F**), and in the locations of backfilled ponds (e.g. at **J** and **K**).

Iron spikes (discrete bipolar anomalies)
Iron items within the topsoil give a distinctive localised bipolar (strong positive with associated strong negative) response. Such items usually derive from relatively recent management or agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris. These are fairly widely scattered with no particular concentrations.

4. DISCUSSION

Detailed magnetic gradiometer survey has revealed a number of linear and curvilinear features of potential archaeological origin, for the most part in the southwestern area of the field. However, overall responses are very weak with little magnetic contrast, so that natural variation may be responsible for some of the less coherent and more intermittent response.

Former areas of medieval ridge and furrow cultivation produce a clear response in the north and west, but otherwise the most obvious anomalies can be matched to the locations of field boundaries and ponds shown on earlier mapping but since removed (Cope-Faulkner 2013, figs 4-7).

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Michael Temple of Lark Energy Ltd who commissioned the project and arranged access; Gary Taylor and

Tom Lane (APS) edited the report.

6. PERSONNEL

Project coordinator: Gary Taylor
Geophysical Survey: Neil Jefferson, Jonathon Smith, Ian Pringle
Survey processing and reporting: Steve Malone

7. BIBLIOGRAPHY

Cope-Faulkner, P. 2013 *Archaeological Desk Based Assessment of Land off Sywell Road, Mears Ashby, Northamptonshire*, unpublished APS report 121/13

English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation.*

Hodge, CAH., Burton, RGO., Corbett, WM., Evans, R., and Seale, RS, 1984 *Soils and their use in Eastern England*, Soil Survey of England and Wales 13

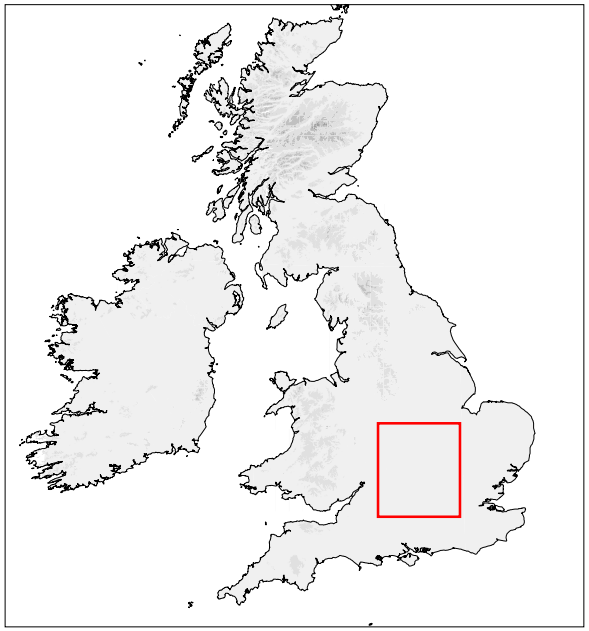
IfA, 2008 *Standard and Guidance for Field Evaluation.*

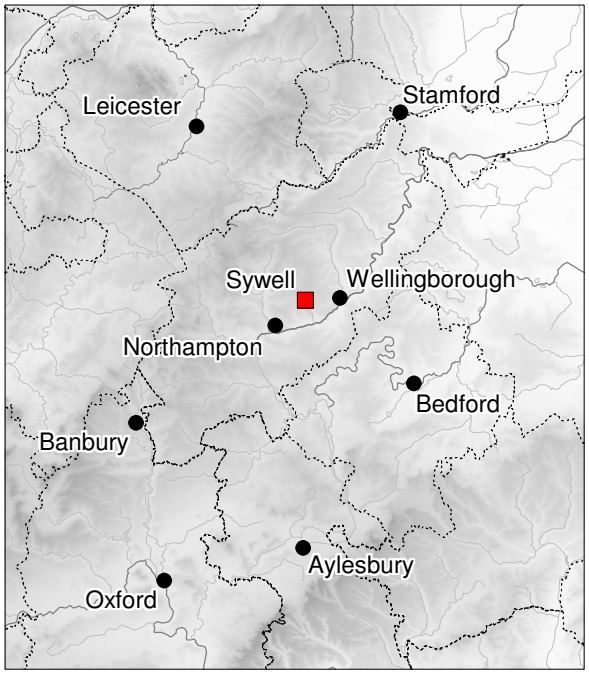
IfA, 2011 *Standard and Guidance for Geophysical Survey.*

8. ABBREVIATIONS

GSGB Geological Survey of Great Britain

IfA Institute for Archaeologists





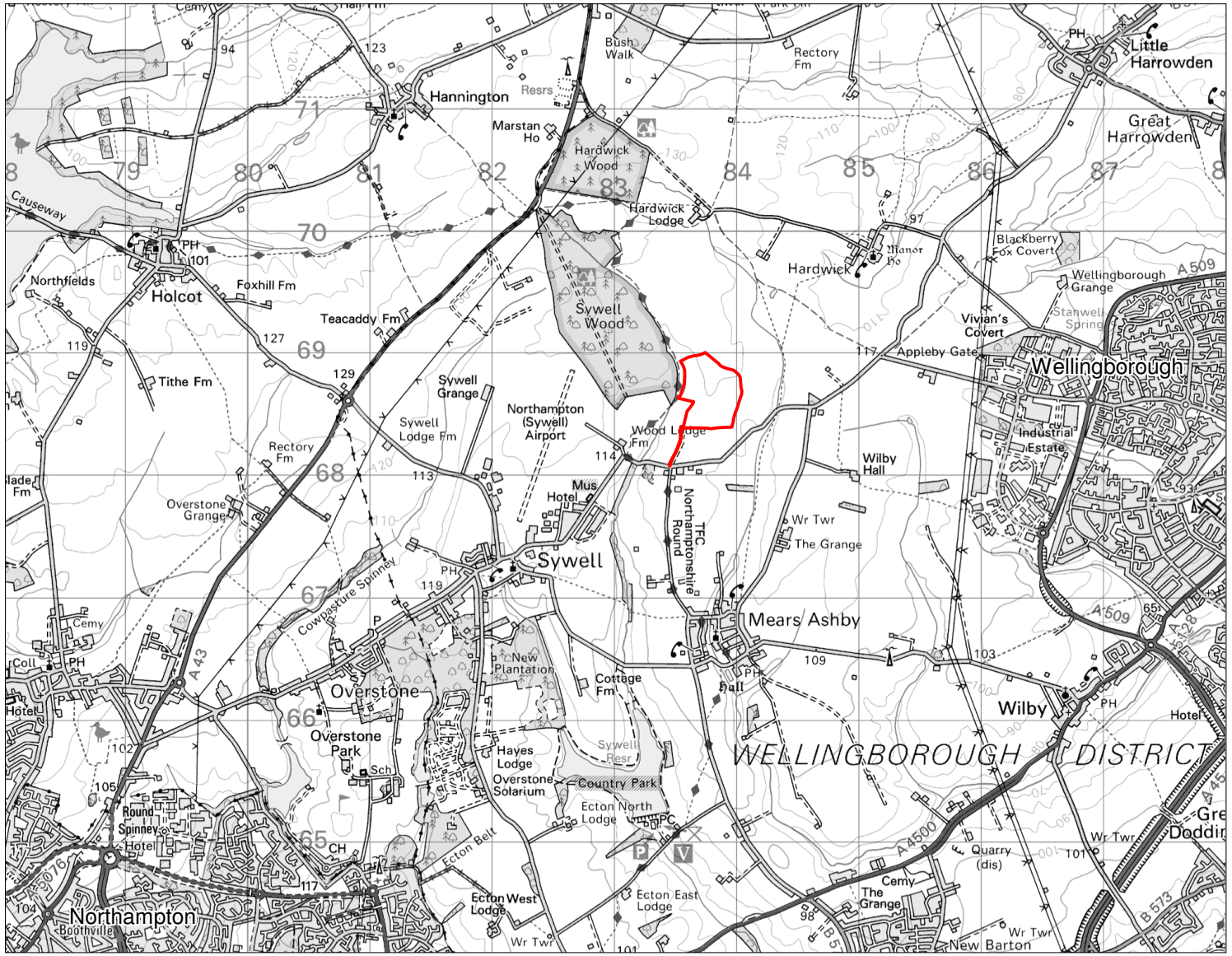


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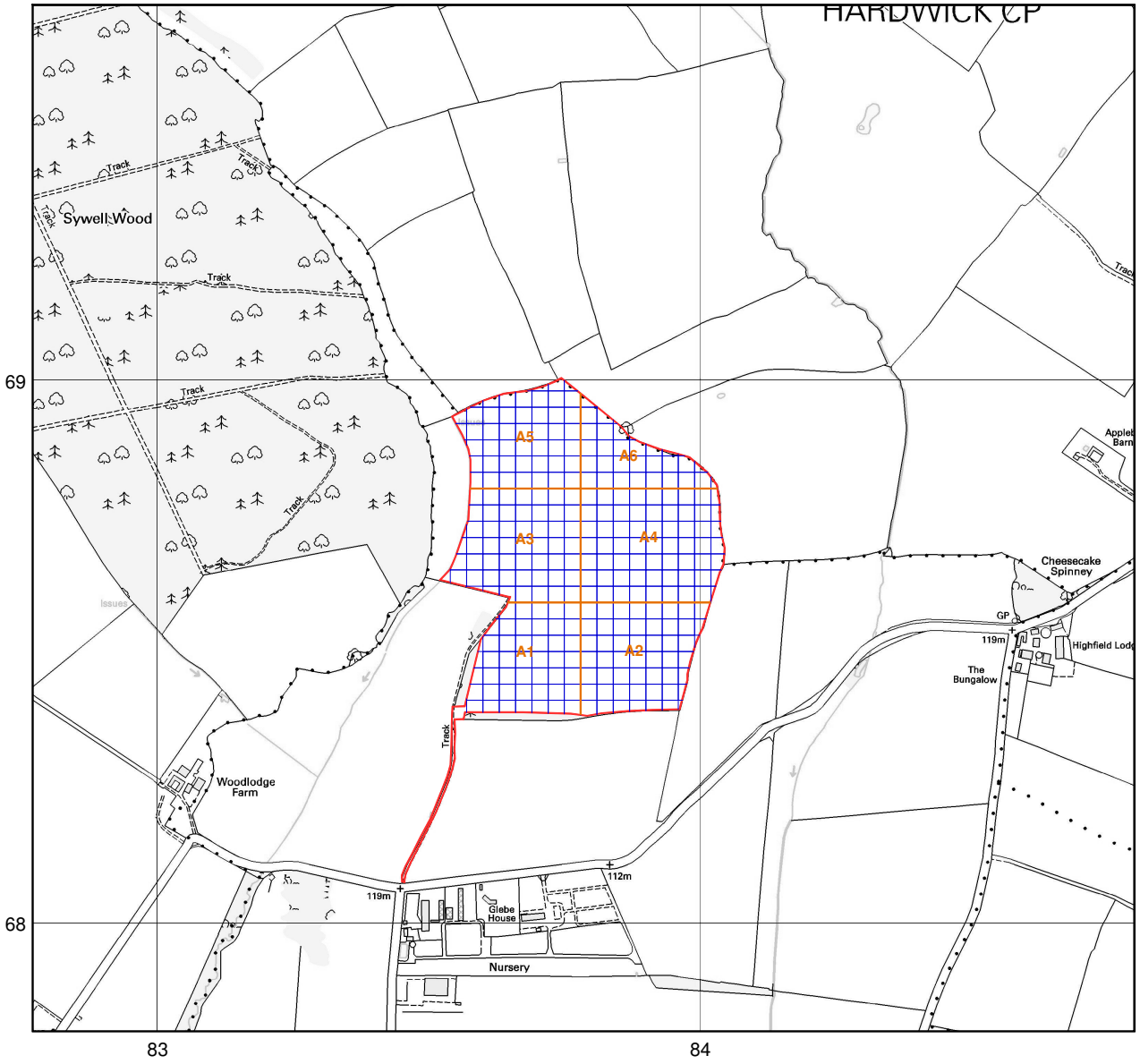
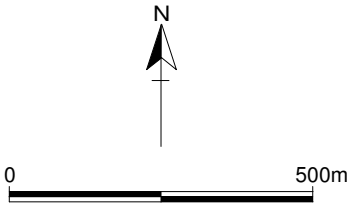
Figure 1 Site location map





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Scale 1:12500	Drawn by: SJM	Report No: 02/14

Figure 2 Location and layout of survey area

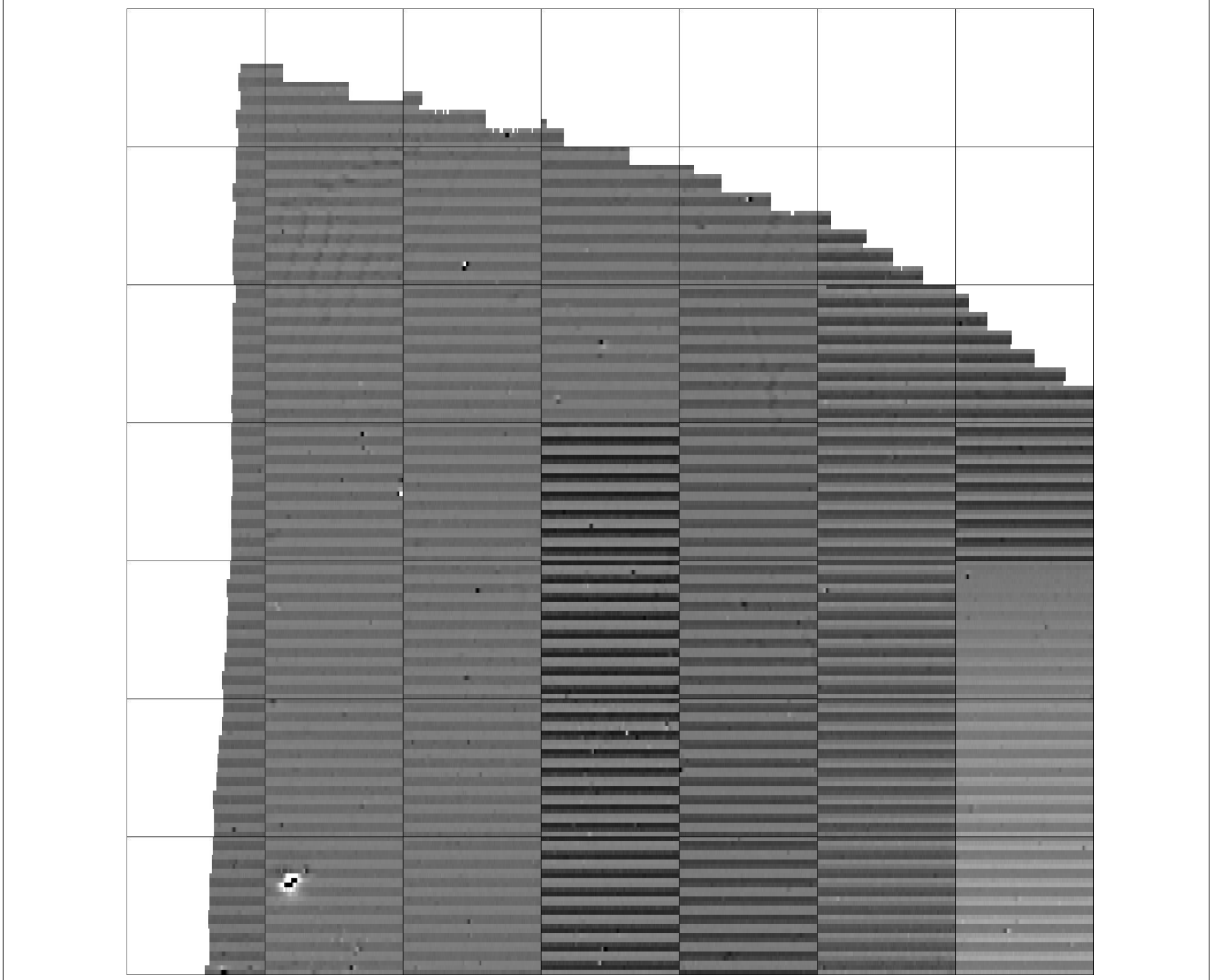
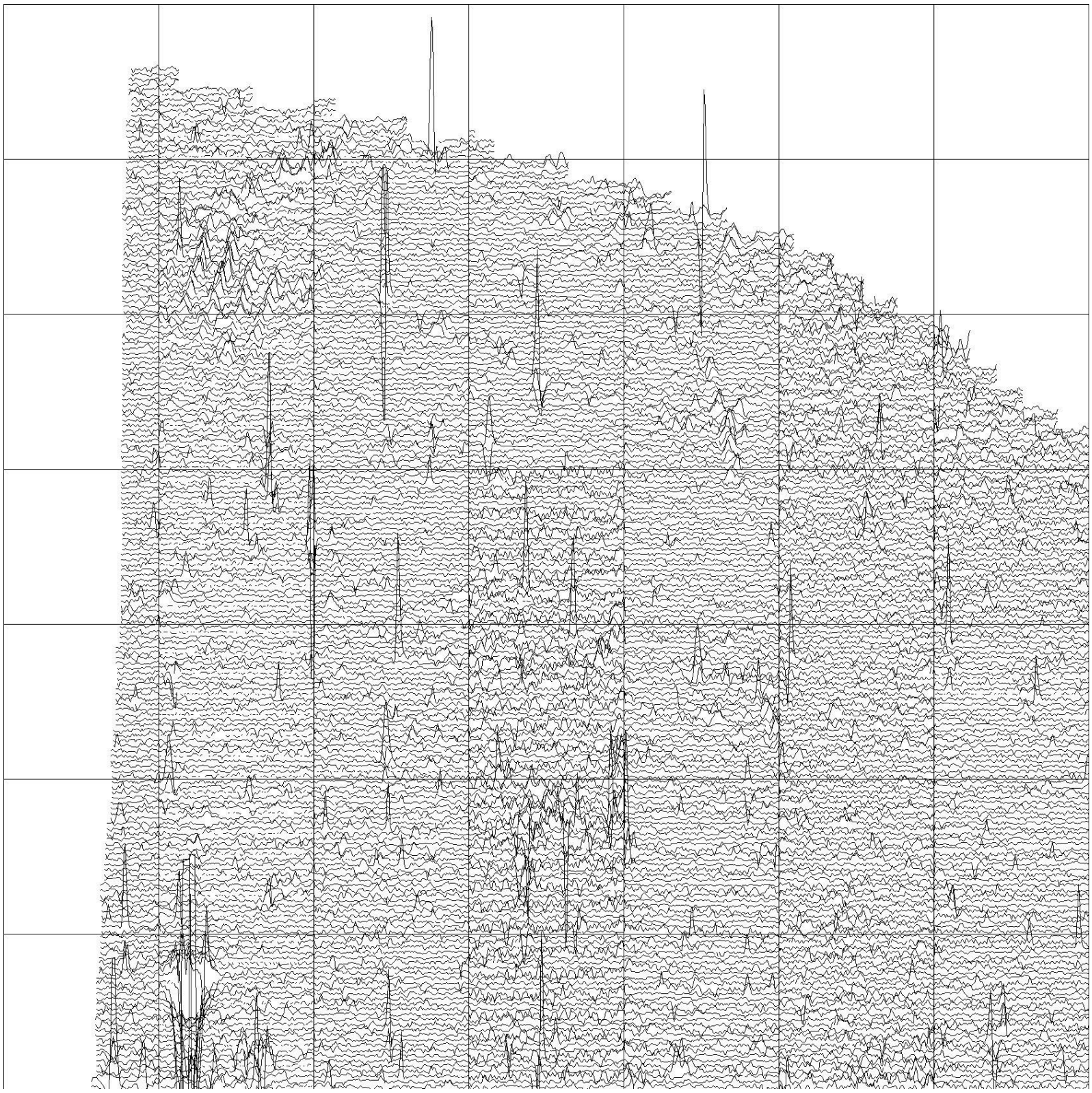


Figure 3 A1 Minimally processed data greyscale plot



20nT
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0
-10
-20nT

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0 50m

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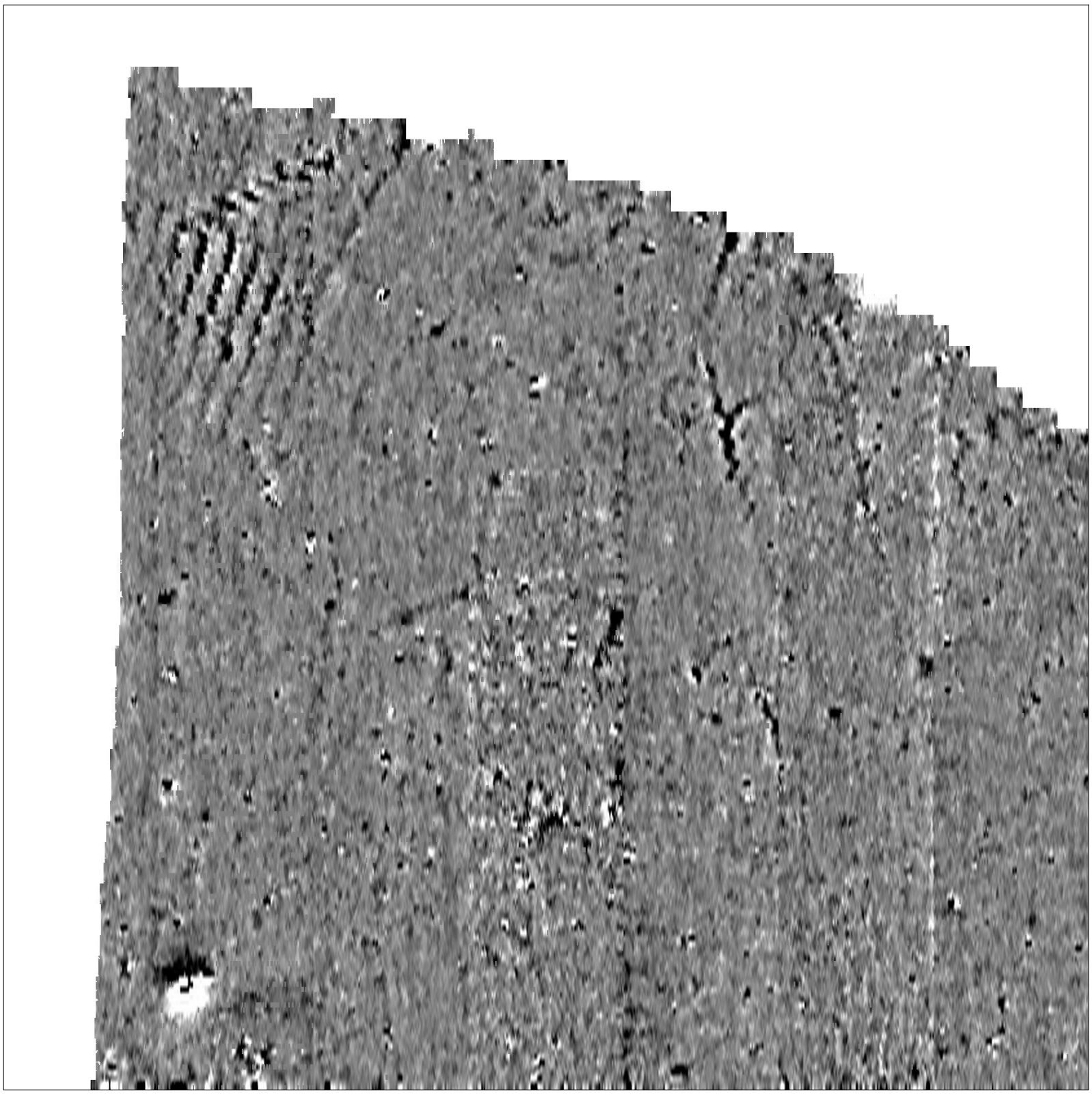
Figure 4 A1 Minimally processed data trace plot



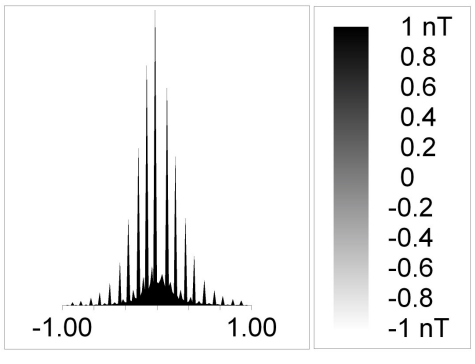


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Figure 5 A1 Processed data greyscale plot

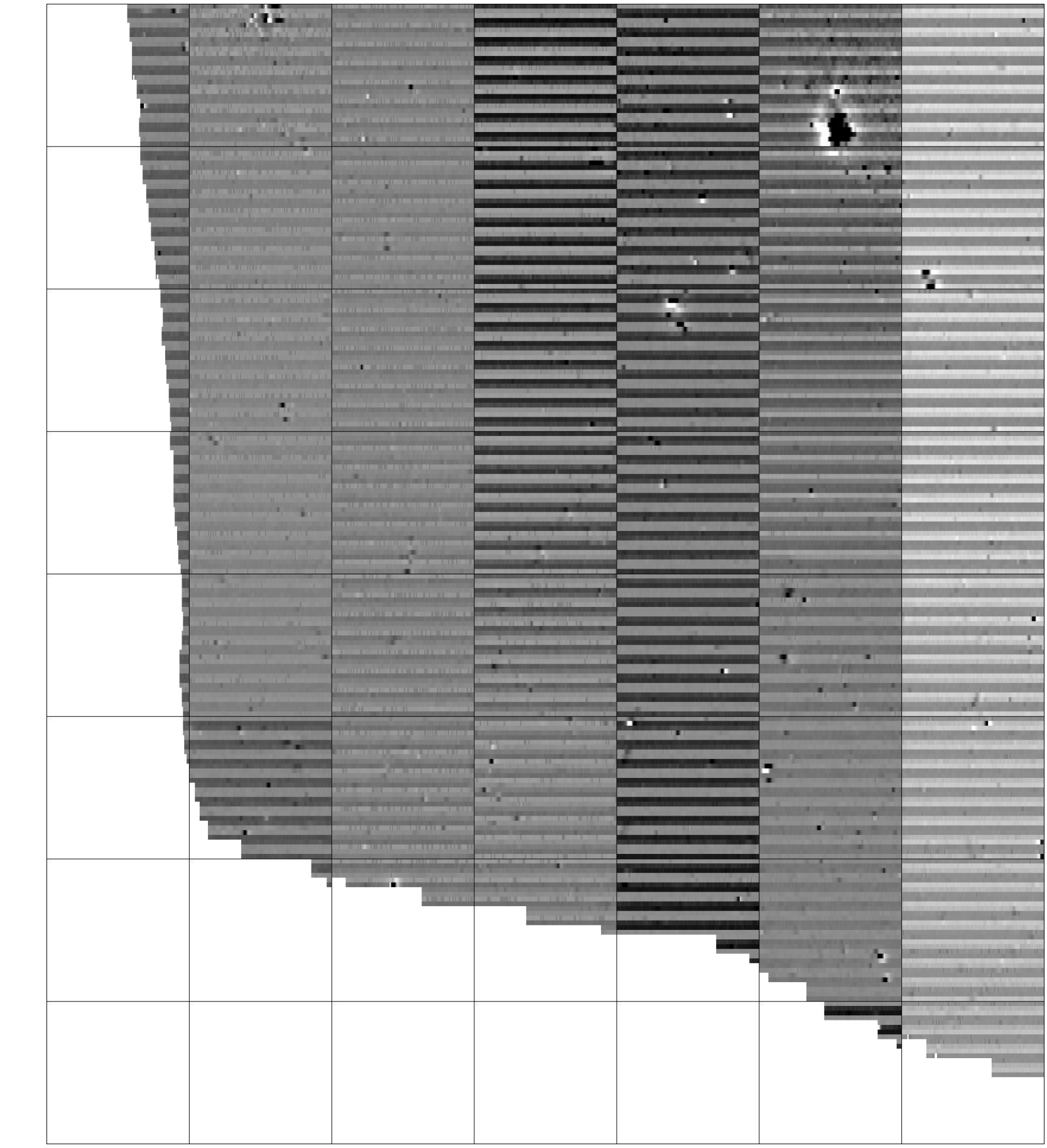
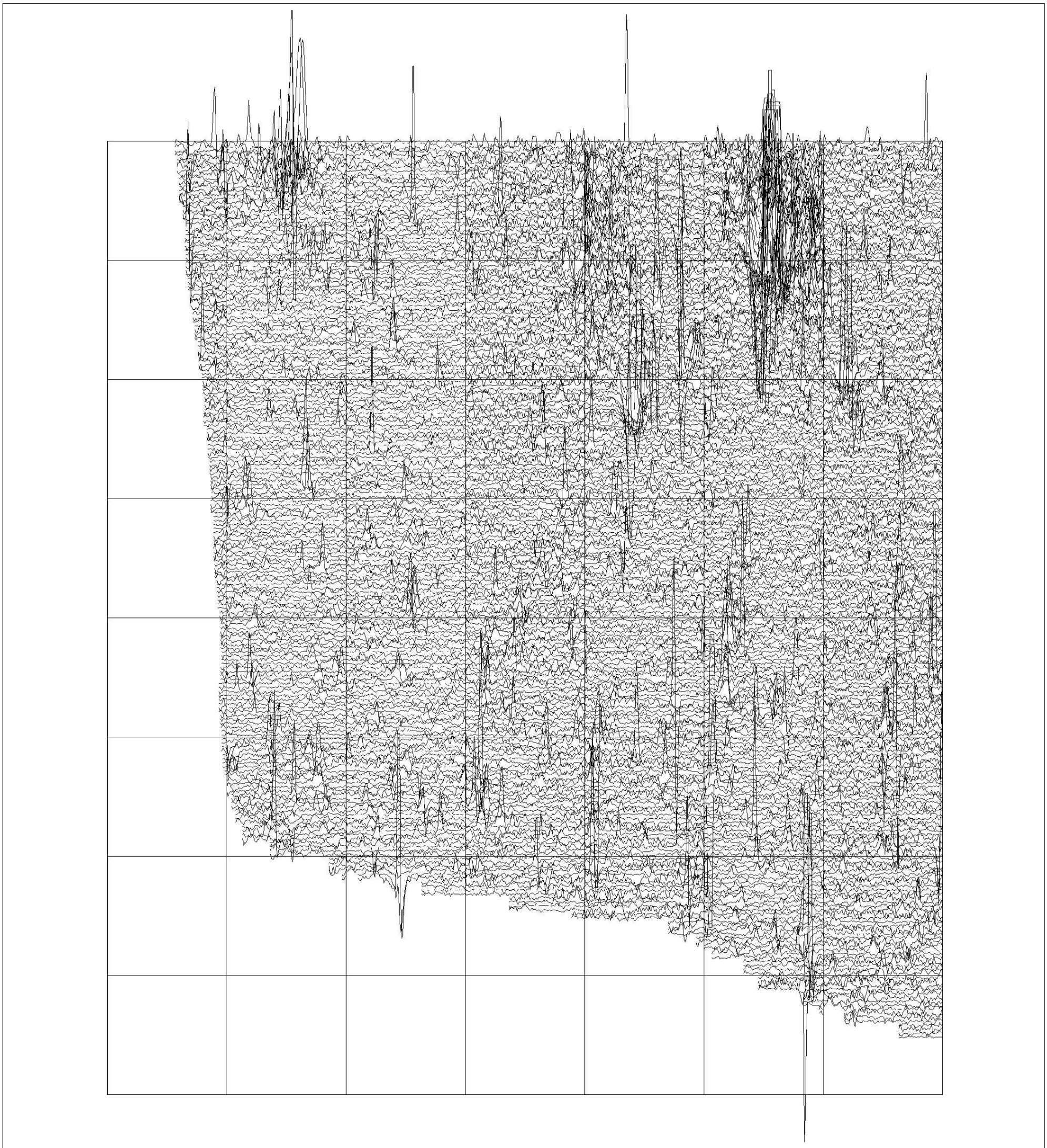


Figure 6 A2 Minimally processed data greyscale plot



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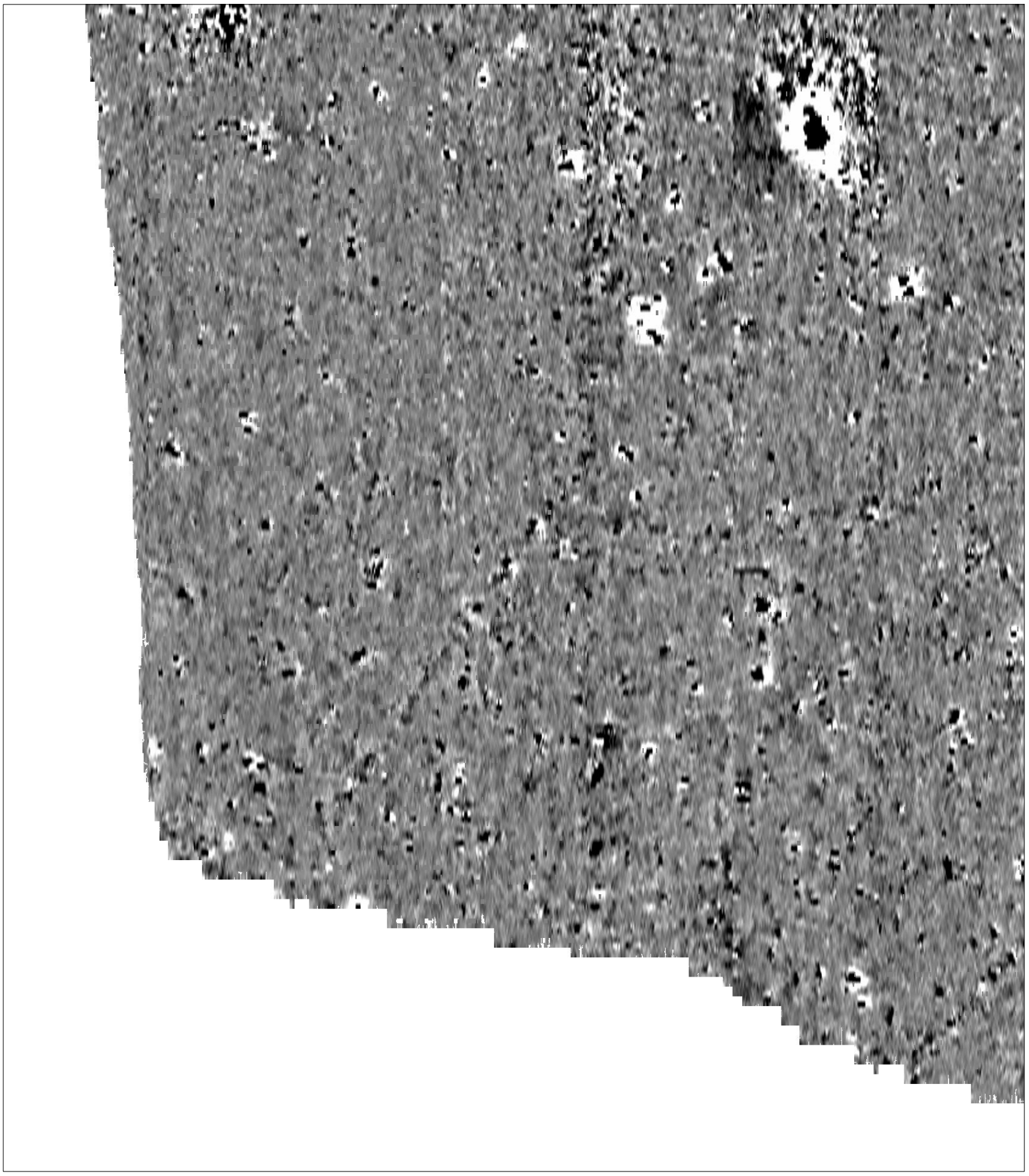

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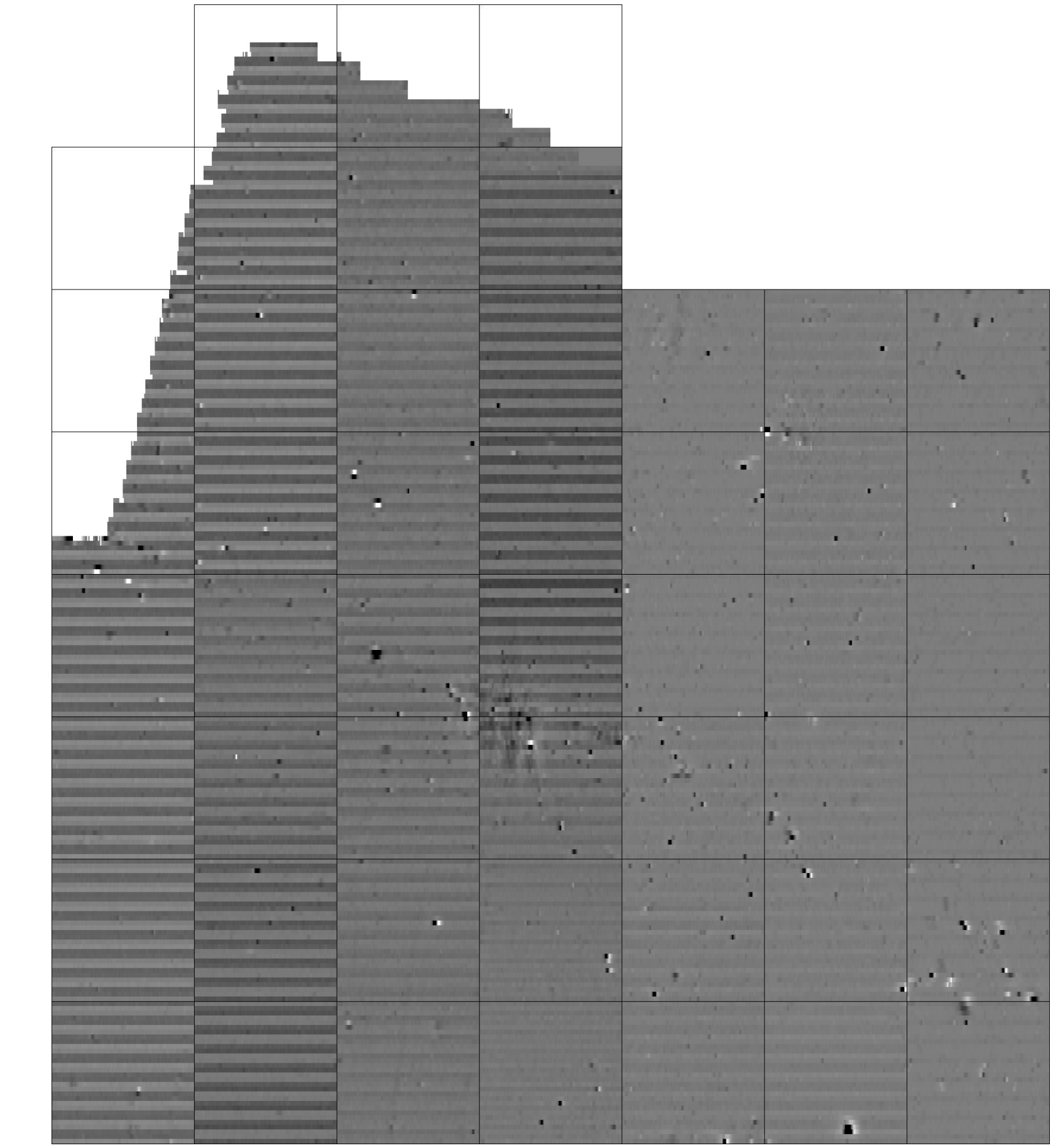

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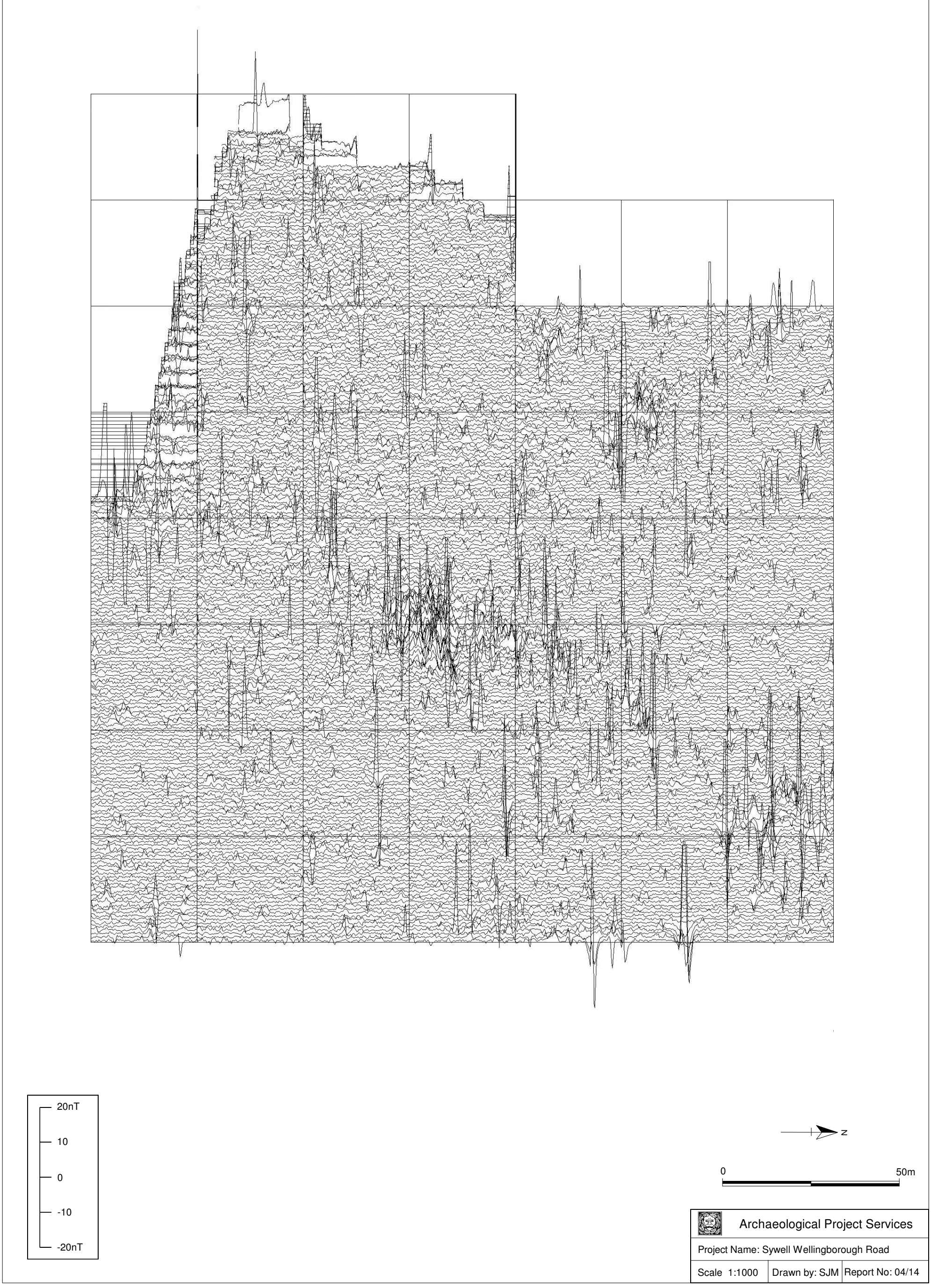

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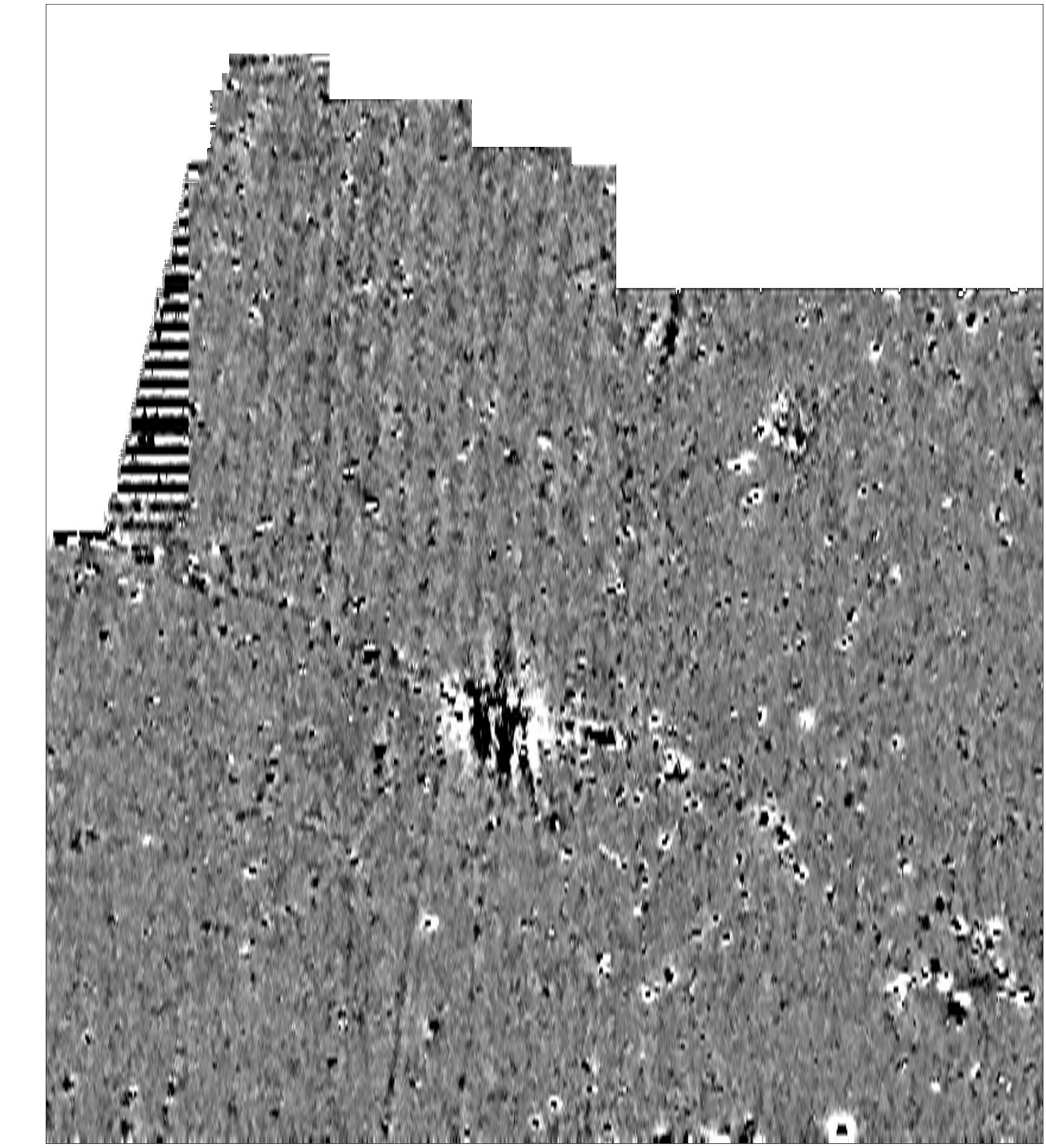

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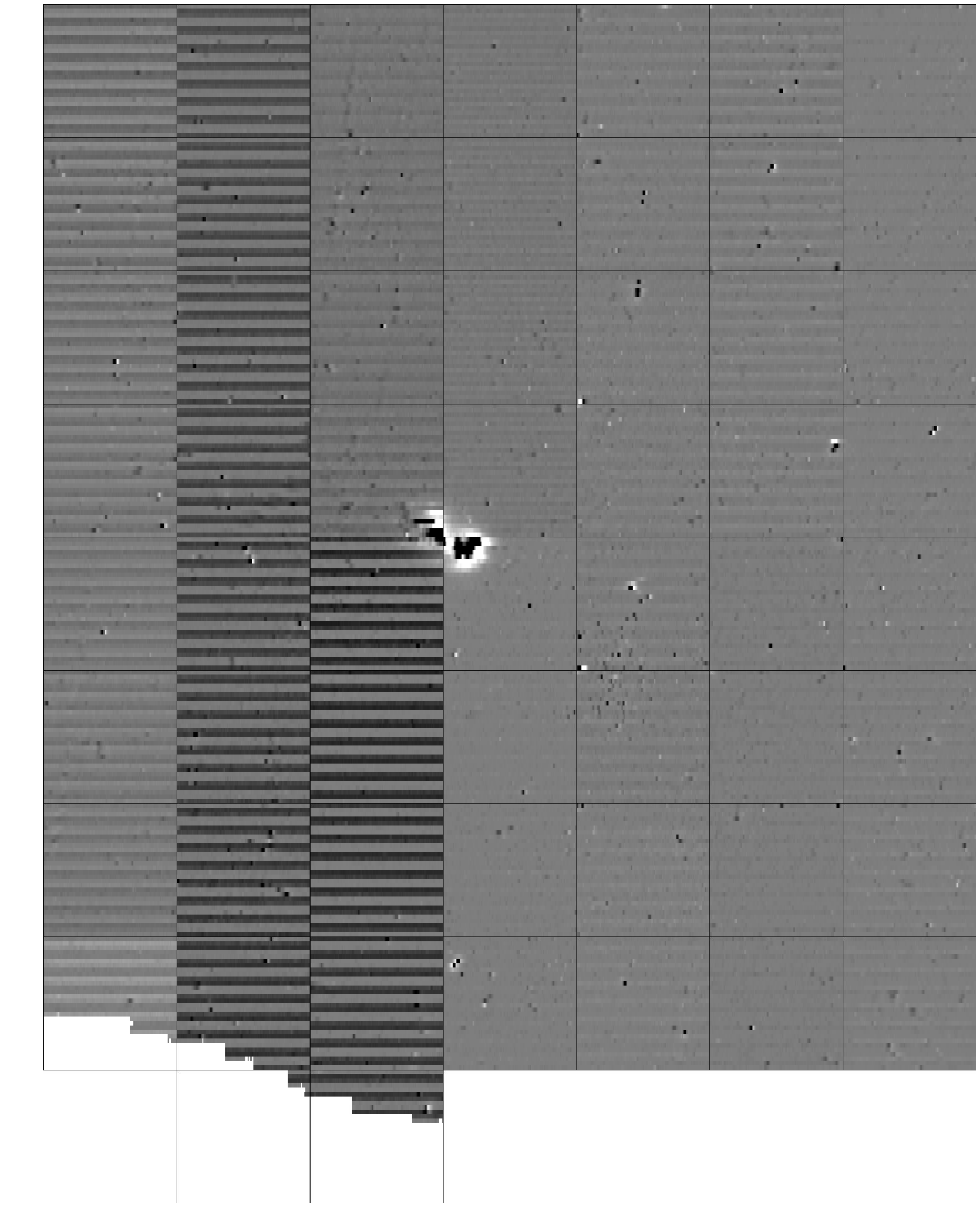

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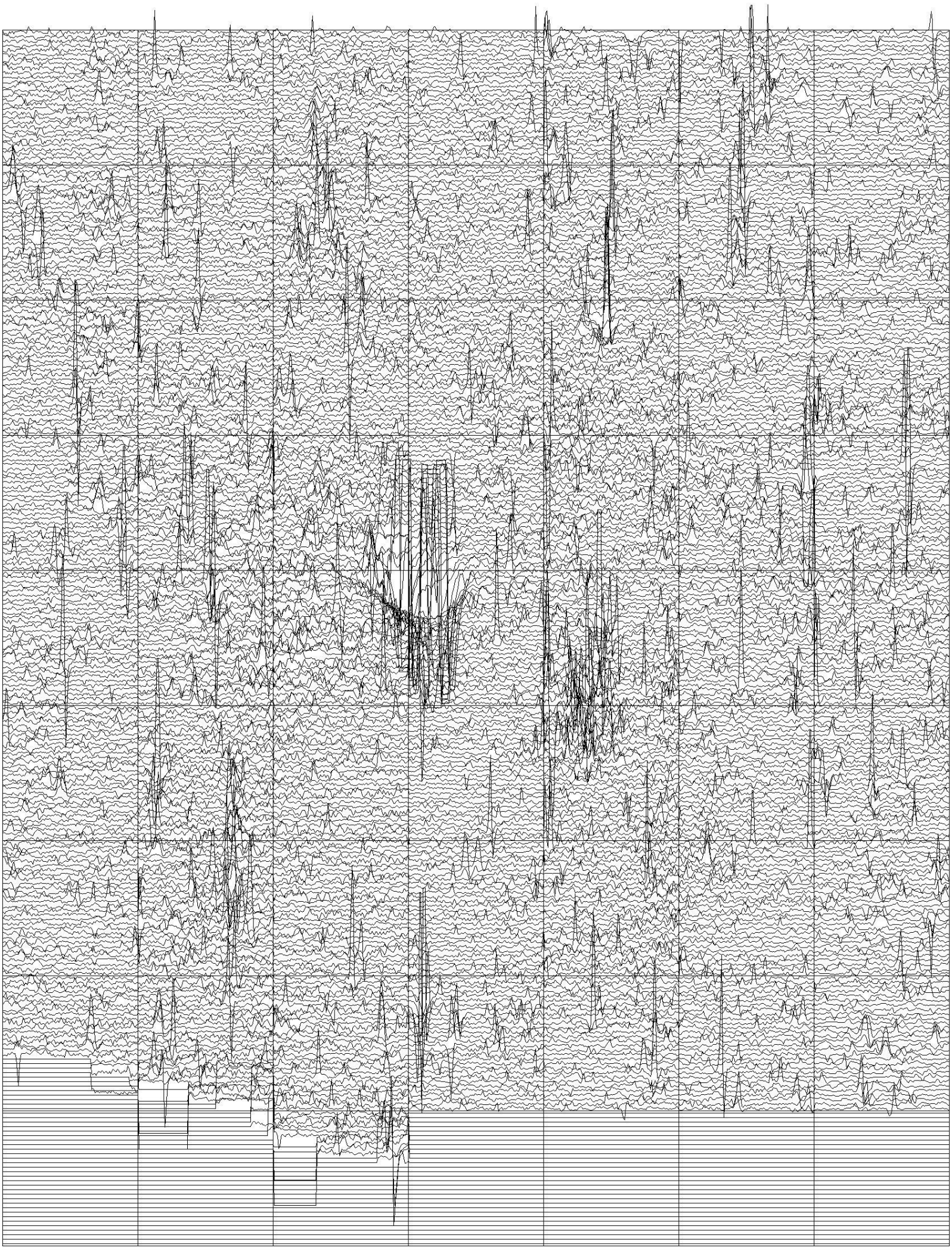


Figure 13 A4 Minimally processed data trace plot

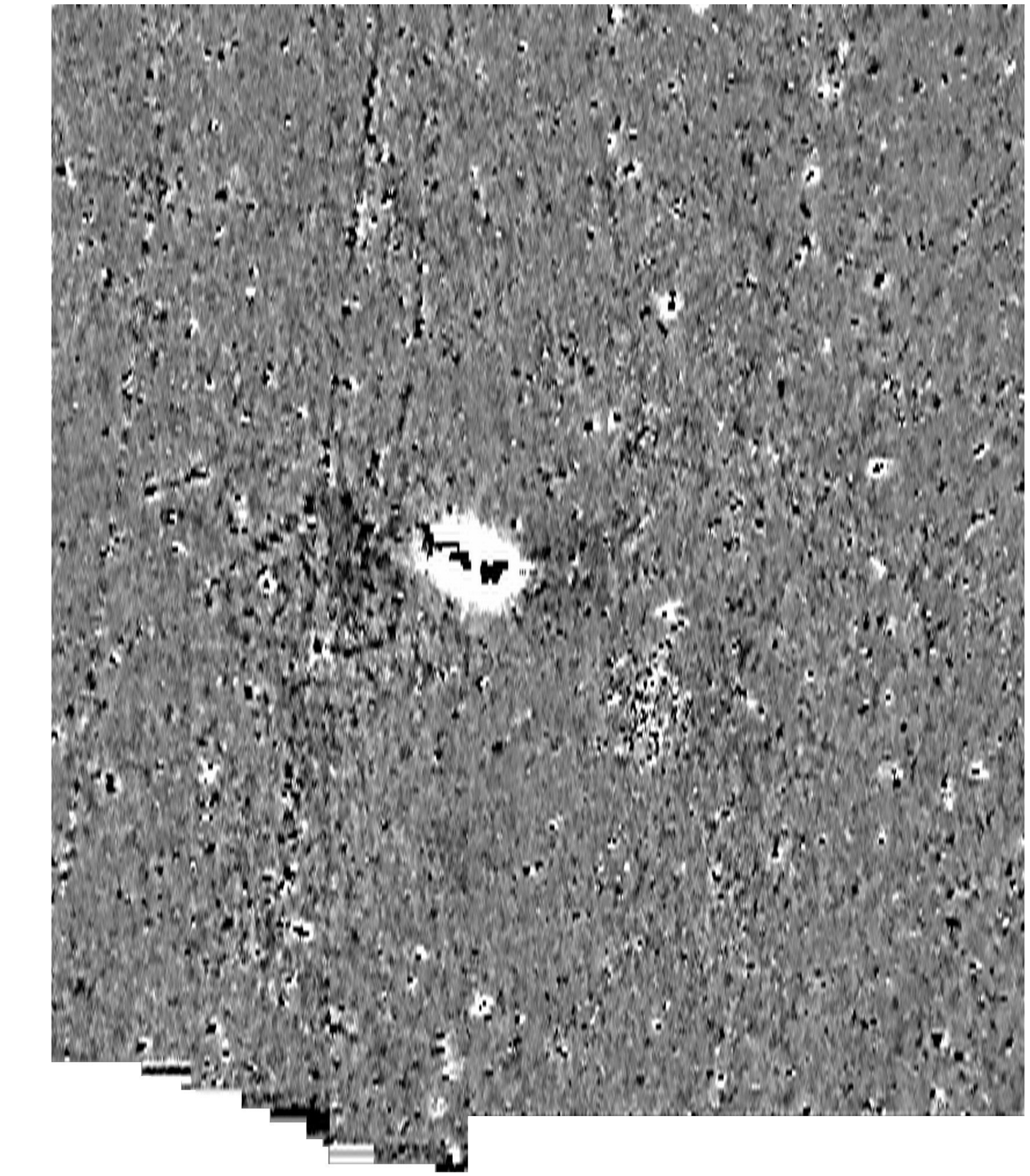
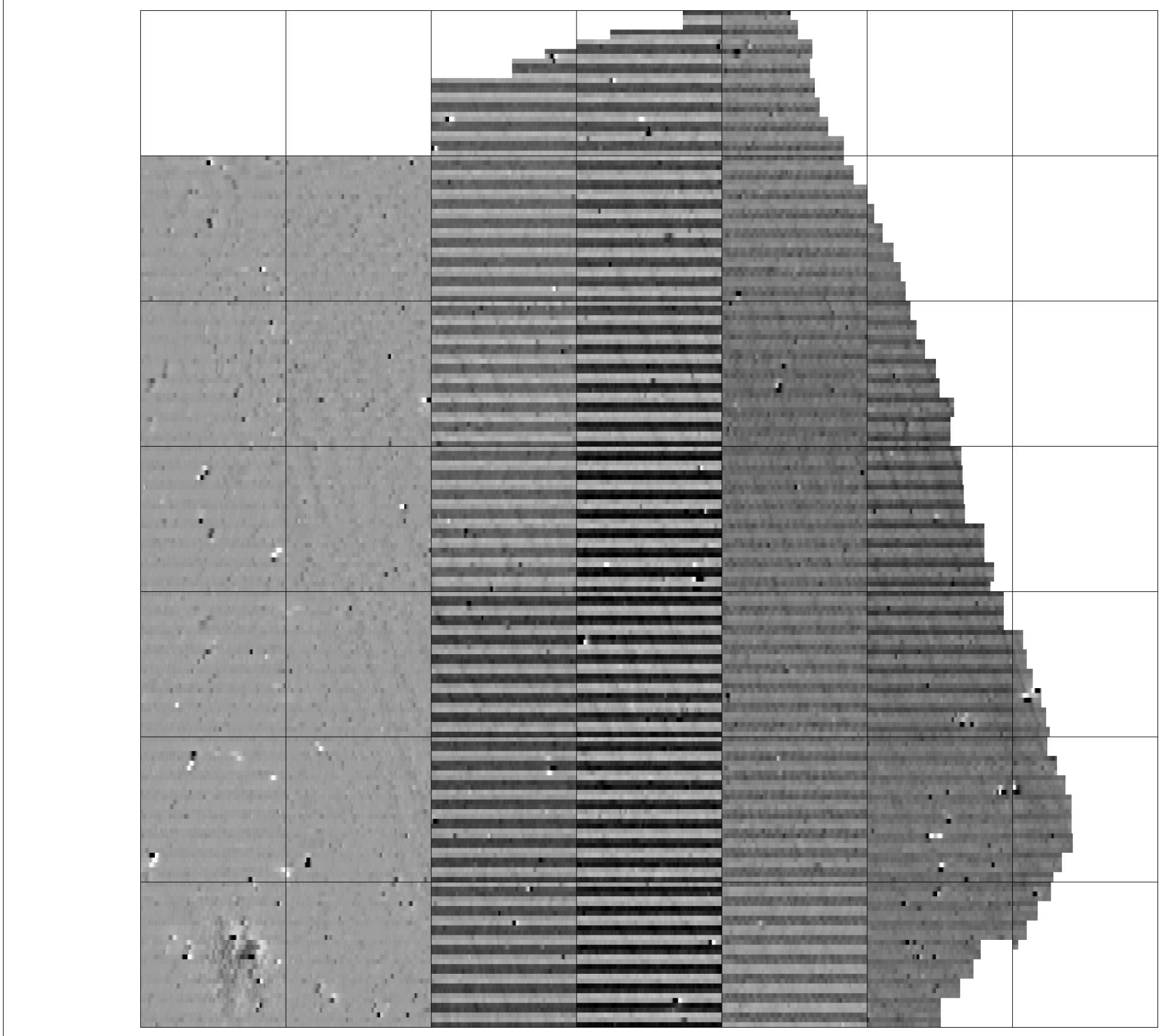


Figure 14 A4 Processed data greyscale plot



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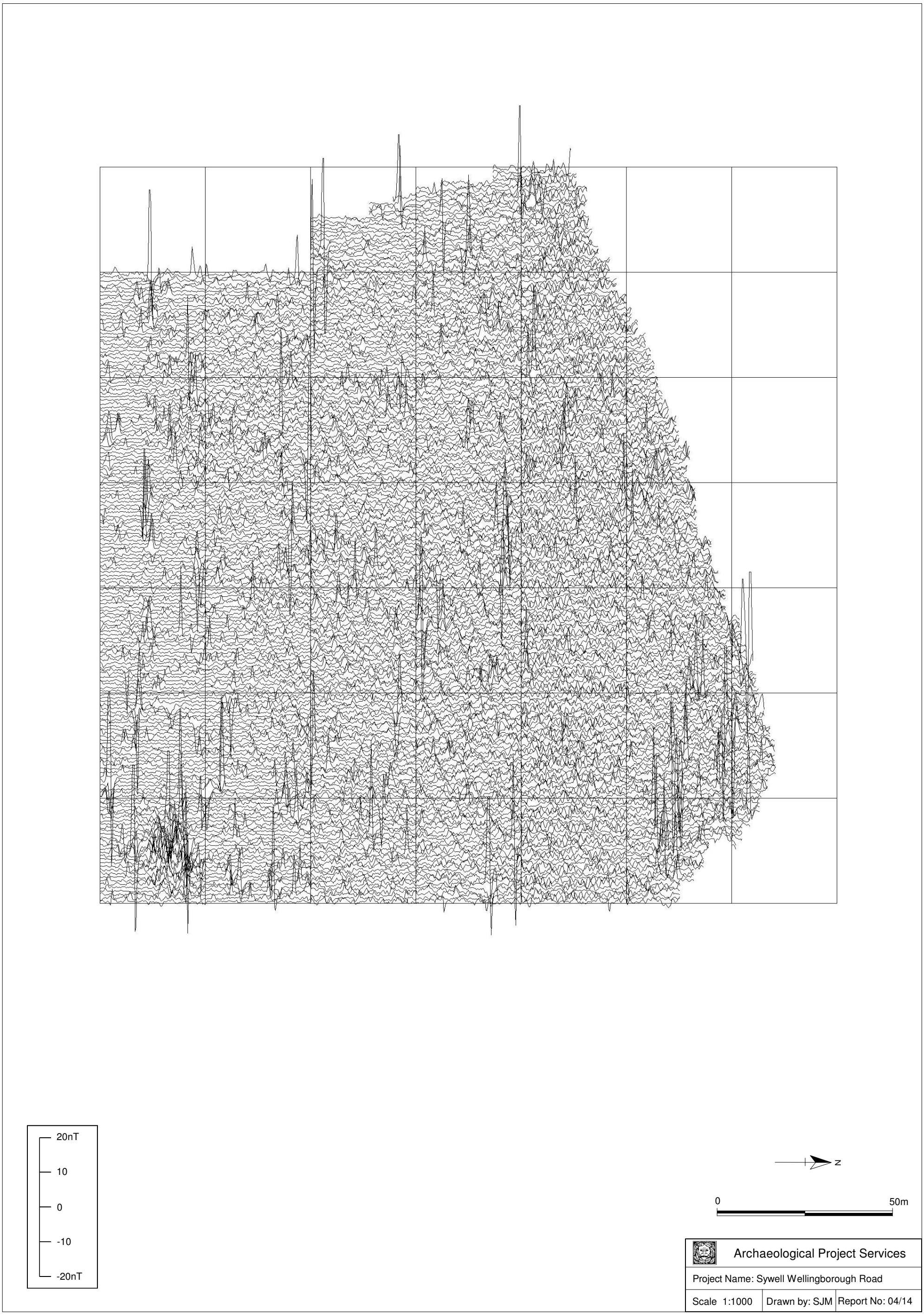

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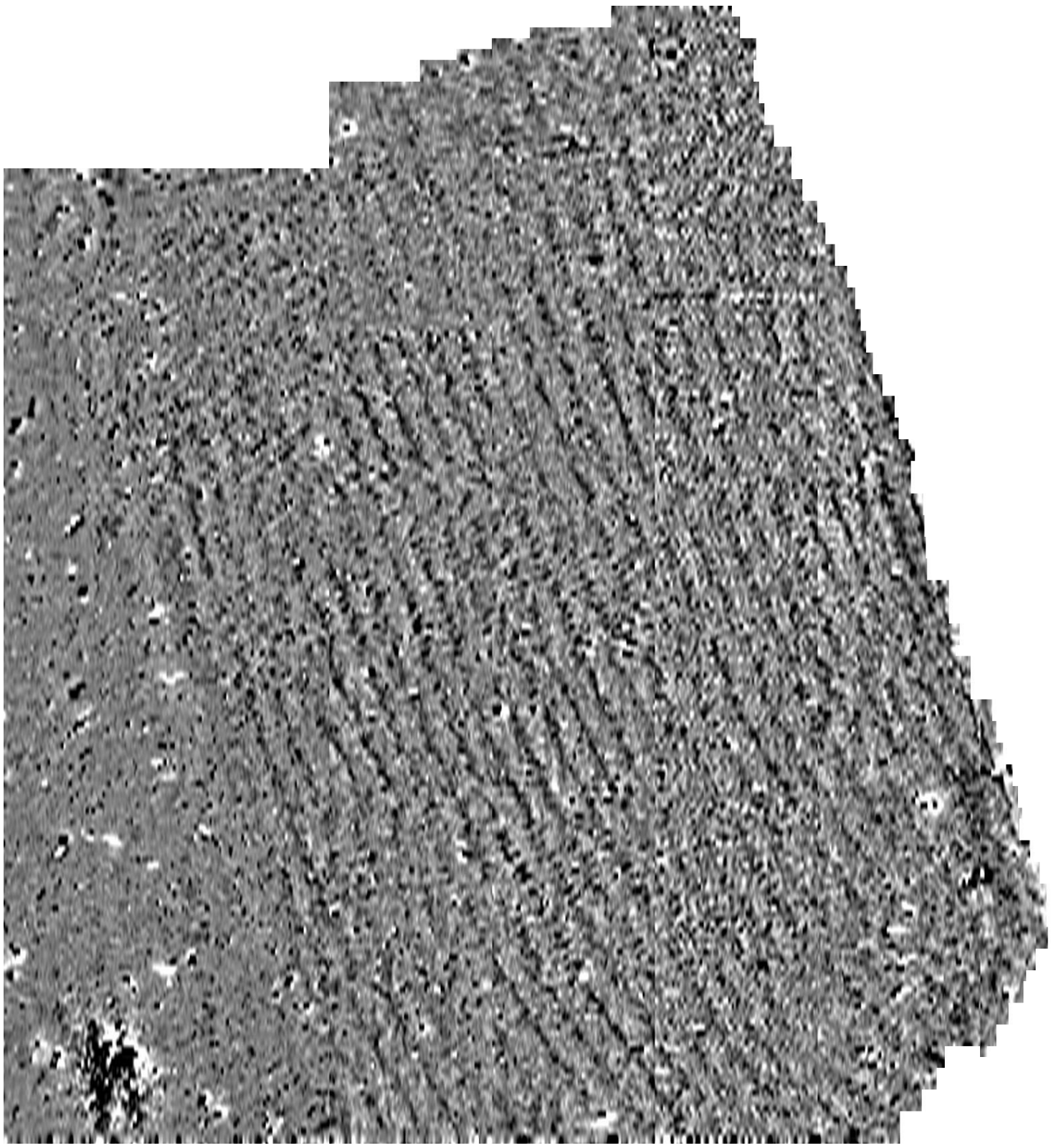

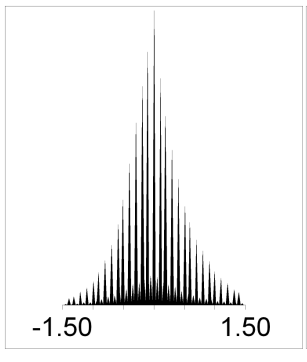

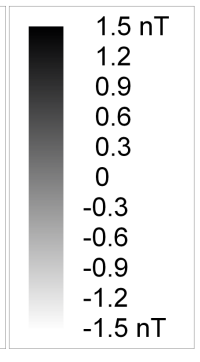

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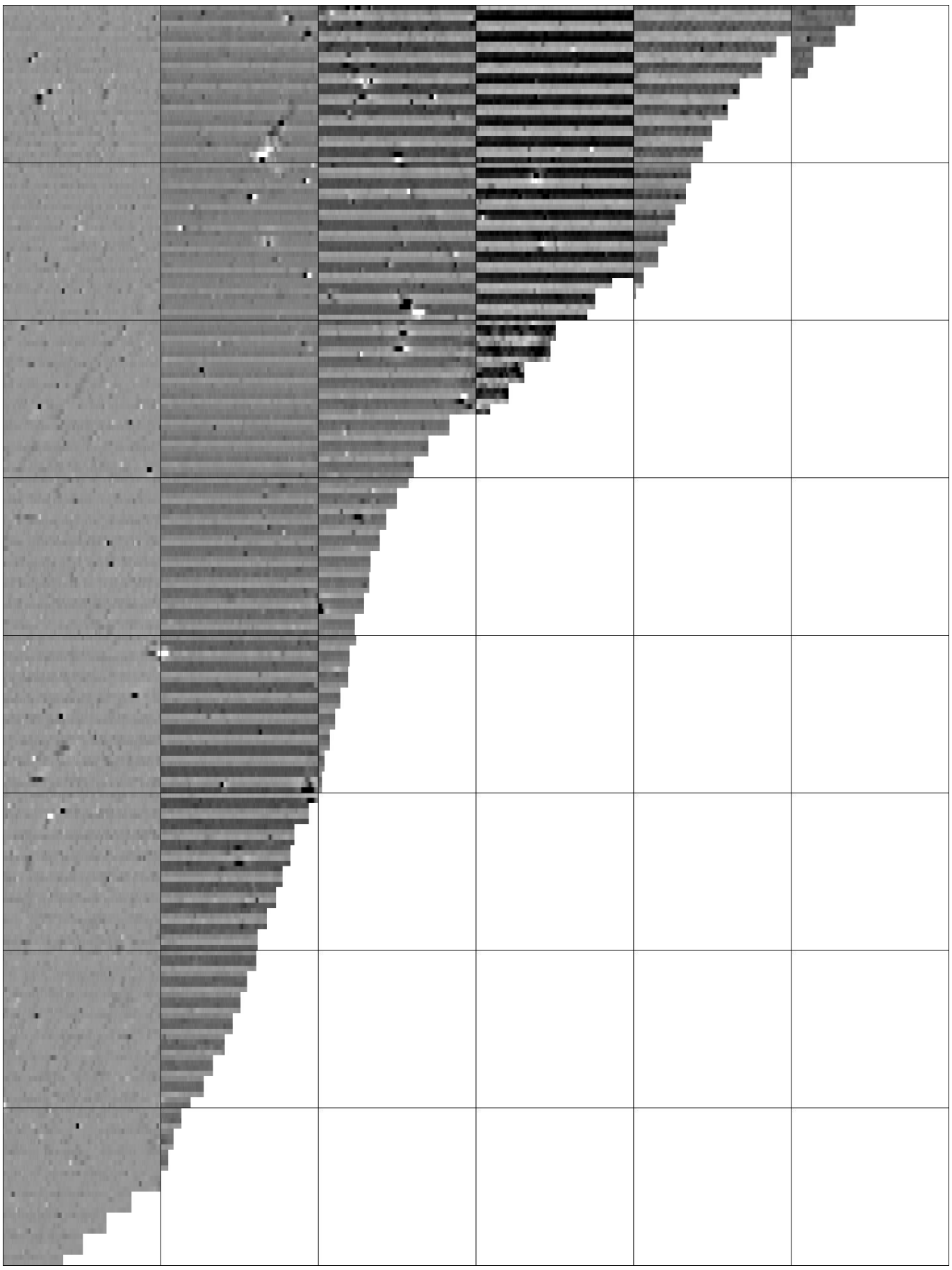
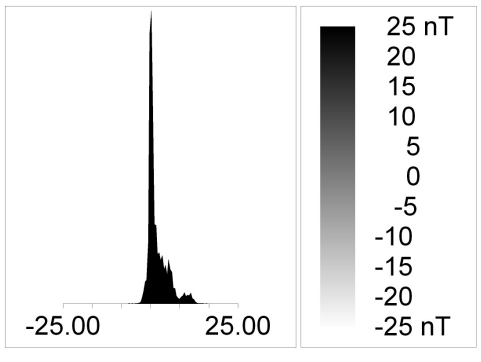
Figure 17 A5 Processed data greyscale plot





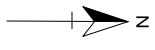


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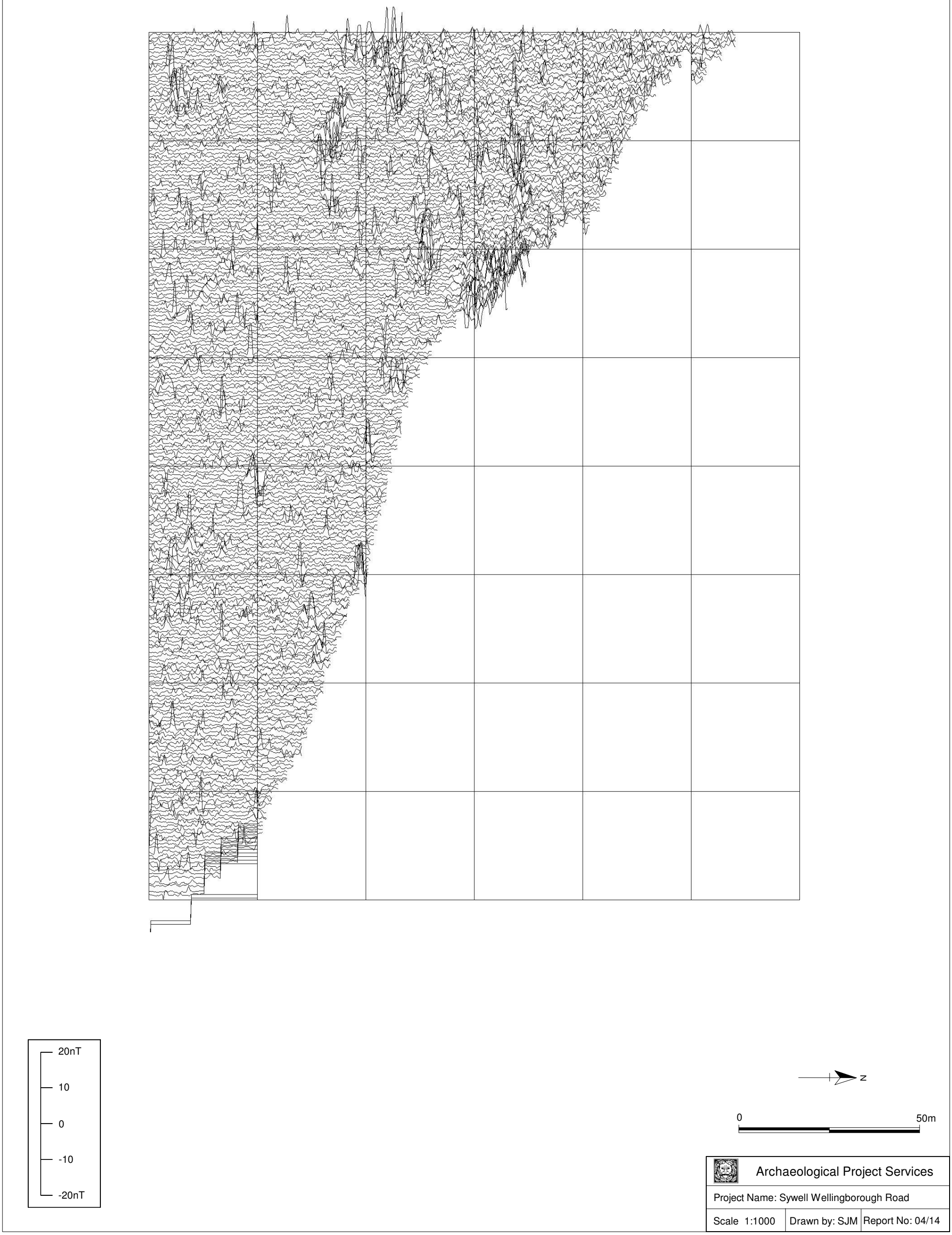
Figure 18 A6 Minimally processed data greyscale plot



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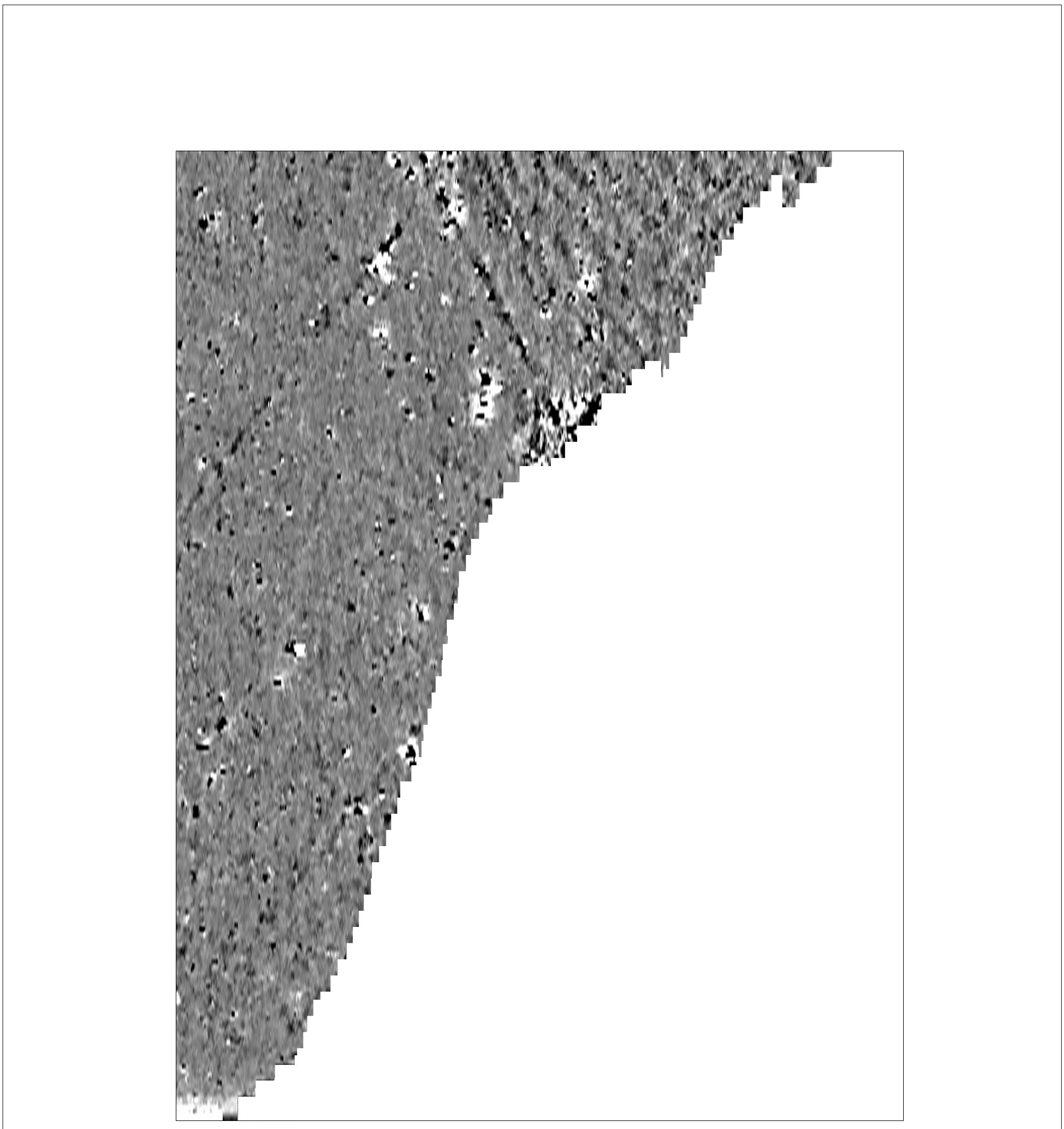

Figure 20 A6 Processed data greyscale plot

Figure 21 Processed data greyscale - overall plot

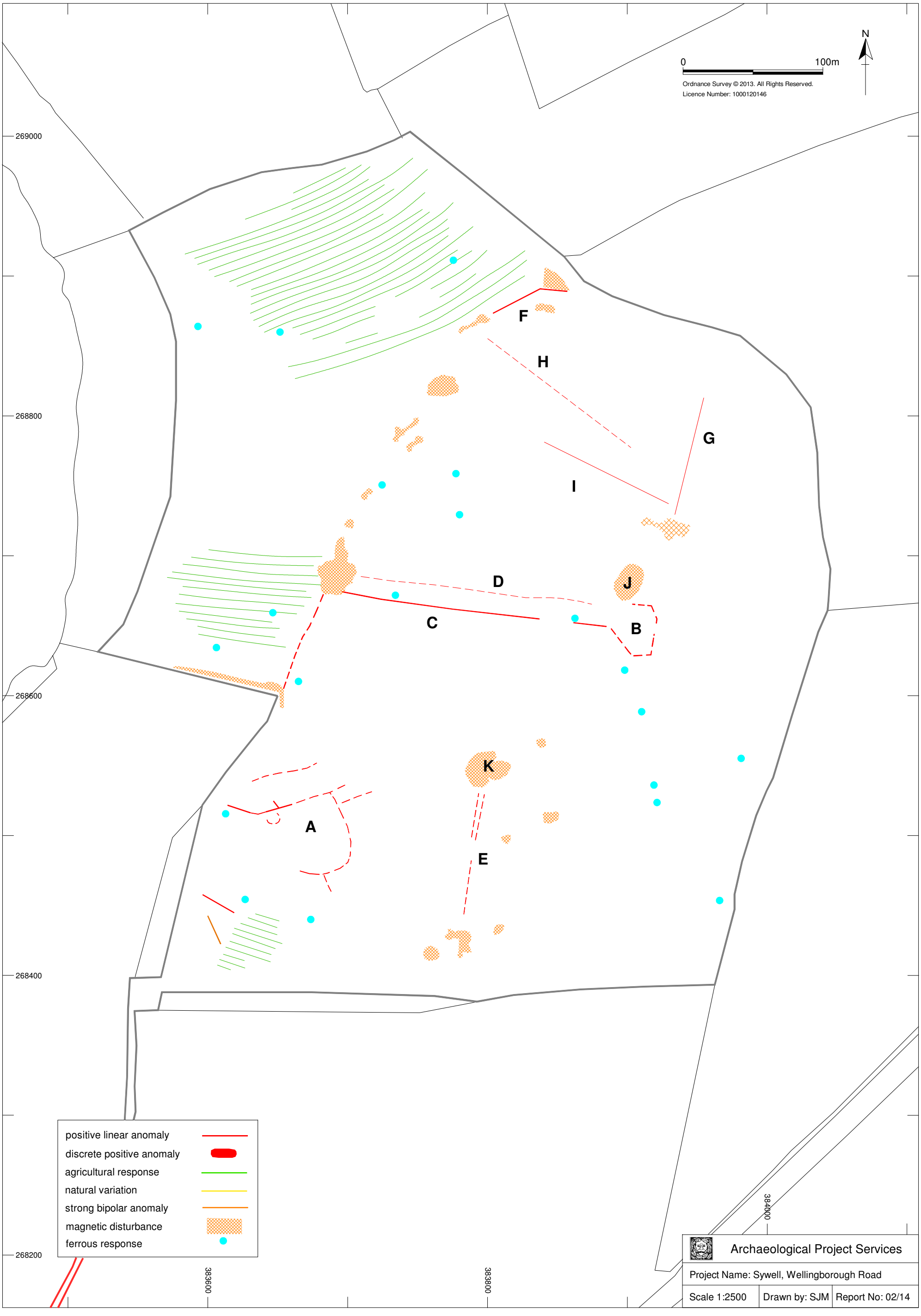

Figure 22 Interpretative plot

Appendix 1

THE ARCHIVE

The archive consists of:

5 Daily record sheets
1 Report text and illustrations
Digital data

File names	Grid files sequentially numbered: SYWR13-1.xgd to SYWR13-34.xgd SYWR13-1.xgd to SYWR13-34.xgd SYWR13-a1.xgd to SYWR13-a18.xgd SYWR13-b1.xgd to SYWR13-b17.xgd SYWR13-c1.xgd to SYWR13-c15.xgd	SYWR13-d1.xgd to SYWR13-d12.xgd SYWR13-e1.xgd to SYWR13-e18.xgd SYWR13-f1.xgd to SYWR13-f34.xgd SYWR13-g1.xgd to SYWR13-g8.xgd SYWR13-h1.xgd to SYWR13-h30.xgd SYWR13-i1.xgd to SYWR13-i19.xgd 01.xgd – 66.xgd	Composite files SYWR13-c1.xcp SYWR13-c2.xcp SYWR13-c3.xcp SYWR13-c4.xcp SYWR13-c5.xcp SYWR13-c6.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. xcp files are composites containing record of all the data and processes used to produce the end product		
Description of file formats	All files are in plain text xml format with header data defining survey and processing parameters		
List of codes used in files	D indicates a "dummy" value within the composite data		
Hardware, software and operating systems	ArcheoSurveyor 2.5.19 running under Windows 7		
Date of last modification	13/01/14		
Indications of known areas of weakness in data			

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Sleaford, Lincolnshire NG34 9RW

APS Site Code: SYWR13